REMARKS

Summary of Office Action

Claims 1-8, 12, 13 and 16-19 are pending in this application.

Claims 16 has been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite.

Claims 1, 12, and 13 have been rejected under 35 U.S.C. § 103(a) as being obvious from Masahiro et al. JP 2004-010409 ("Masahiro"). Claims 2-5, 8 and 16 have been rejected under 35 U.S.C. § 103(a) as being obvious from Masahiro and further in view of Hase et al. U.S. Patent No. 5,839,718 ("Hase"), Kanerari et al. U.S. Patent No. 6,431,236 ("Kanerari"), Murazaki et al. U.S. Patent No. 6,617,781 ("Murazaki") and Yocom et al. U.S. Patent No. 6,071,432 ("Yocom"). Claims 6 and 7 have been rejected under 35 U.S.C. § 103(a) as being obvious from Masahiro in view of Murayama et al. U.S. Patent No. 5,424,006 ("Murayama").

Claims 1, 6-8, 12, 13 and 16-19 have been rejected under 35 U.S.C. § 103(a) as being obvious from Availvs Corp. WO 03/057796 (using Saito et al. U.S. Patent No. 7,074,345 ("Saito") as the English language translation) in view of Odlum U.S. Patent No. 6,197,712 ("Odlum") and Masahiro. Claims 2-5 and 16 have been rejected under 35 U.S.C. § 103(a) as being obvious from Saito in view of Odlum and further in view of Hase, Kanerari, Murazaki, and Yocom.

Summary of Applicants' Reply

Applicants have amended claim 16 to more particularly define the claimed invention. No new matter has been added and the amendments are fully supported by the originally filed specification.

The Examiner's rejections are respectfully traversed.

Reply to the Section 112 Rejection

Claims 16 has been rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. The Examiner stated that "consisting essentially of" was improper Markush terminology and suggested rewording the claim.

Applicants have reworded the claim and respectfully submit that the claim is no longer indefinite. Accordingly, applicants respectfully request that the Section 112 rejection be withdrawn.

Reply to the Rejections Under 35 U.S.C § 103(a)

Claims 1, 2-8, 12, 13 and 16

Claims 1, 12, and 13 have been rejected under 35 U.S.C. § 103(a) as being obvious from Masahiro. Claims 2-8 and 16 have been rejected under 35 U.S.C. § 103(a) as being obvious from Masahiro in view of Hase, Kanerari, Murazaki, Yocom, or Murayama ("secondary references").

Applicants' claim 1 is directed to a light-storage self-luminescent glass that includes (a) 0.01-40% by weight of a light-storage self-luminescent material activated by multiple ions and (b) 99.99-60% by weight of a matrix glass. The light-storage self-luminescent material has a particle size ranging from 0.8 mm to 20 mm.

Masahiro describes a process for producing a glass article which consists of molten glass and a powdery luminous stone. The size of the powdery luminous stone ranges from 0.1-1.0 mesh (Masahiro, Abstract and paragraphs 7, 12 and 14).

The Examiner cited a Particle Size Conversion table ("Sigma-Aldrich") and alleged that according to Sigma-Aldrich, a particle size with a range of 0.1-1 mesh is equivalent to 0.1-1 inch, or 2.54-25.4 millimeters (Office Action, page 3). Applicants respectfully disagree.

Applicants respectfully submit that, according to the universal definition, mesh (m) is equal to the number of openings per linear inch (i.e., m = 1/(particle size in inches)). Sigma-Aldrich applies the universal definition for particles smaller than 0.25 inch, equivalent to mesh values greater than 4 (i.e., m = 1/0.25). Sigma-Aldrich deviates from the universal definition for particles greater than 0.25 inch and less than 1 inch in that Sigma-Aldrich assigns a mesh value that is equal to the particle size for particles in these size ranges (i.e., $0.25 < m < 1$).

Sigma-Aldrich leaves the mesh value undefined for particles greater than 1 inch. Indeed, Sigma-Aldrich cannot use the universal definition for at least particles greater than 1 inch but less than 4 inches because the mesh values would overlap with those which have already been defined by Sigma-Aldrich (i.e., $0.25 < m < 1$). Thus, Sigma-Aldrich must be considered relevant only to Sigma-Aldrich products, and not representative of a universal definition of mesh size. Because the mesh value of 0.1 does not fit into the definition one can derive from Sigma-Aldrich, one must revert to the universal definition to

determine its corresponding inch size. More specifically, according to the universal definition 0.1 mesh is equivalent to a particle size of 10 inches (i.e., 1/(0.1 mesh)).

Therefore, the mesh size of 0.1-1 mesh (i.e., 1-10 inches) discussed in Masahiro does not overlap a particle size ranging from 0.8 mm to 20 mm (i.e., about 0.03-0.79 inch), as defined by applicants' claim 1.

None of the secondary references, cited by the Examiner as showing additional limitations of the claims, make up for the deficiencies of Masahiro relative to the rejection.

Accordingly, applicants' independent claim 1, and claims 2-8, 12, 13 and 16 which depend, directly or indirectly, from claim 1, are patentable.

Claims 1, 2-5, 6-8, 12, 13 and 16-19

Claims 1, 6-8, 12, 13 and 16-19 have been rejected under 35 U.S.C. § 103(a) as being obvious from Saito in view of Odlum and Masahiro. Claims 2-5 and 16 have been rejected under 35 U.S.C. § 103(a) as being obvious from Saito and Odlum, further in view of Hase, Kanerari, Murazaki, and Yocom.

Applicants' claims 1 and 17 are directed to a light-storage self-luminescent glass that includes (a) 0.01-40% by weight of a light-storage self-luminescent material activated by multiple ions and (b) 99.99-60% by weight of a matrix glass. The light-storage self-luminescent material has a particle size ranging from 0.8 mm to 20 mm (claim 1) or a particle size ranging from 0.8 mm to 2 mm (claim 17) -- 800-20,000 microns and 800-2000 microns respectively.

Saito, generally speaking, discusses the

formation of a photoluminescent material by blending a transparent base material such as a resin and a photoluminescent pigment component having particle sizes ranging from 10 to 2000 microns (Saito, col. 2, line 60 to col. 3, line 3).

Odlum describes a method to produce phosphorescent glass artifacts by mixing soda-lime-silica glass with a phosphor particle size ranging from 18 to 25 microns (Odlum, col. 2, lines 9-17).

The Examiner acknowledges that Saito does not show or suggest the composition of the glass of applicants' claims 1 and 17 and cites Odlum as allegedly showing a conventional sodium-calcium-silicate glass composition. The Examiner states that it would be obvious to one of ordinary skill in the art to use any glass composition to form applicants' light storage self-luminescent glass (Office Action, p. 5). Applicants respectfully disagree.

Applicants respectfully submit that Saito, Odlum and Masahiro, whether taken alone or in combination, do not show or suggest a light-storage self-luminescent glass that includes self-luminescent material with a particle size ranging from 0.8 mm to 20 mm or a particle size ranging from 0.8 mm to 2 mm, as defined by applicants' claims 1 and 17, respectively. Saito discusses methods of producing photoluminescent material by blending transparent base materials (i.e., resins) with pigment components having particle sizes ranging from 10 to 2000 microns. While Saito states that the "transparent base material may be a resin, glass or the like," Saito provides only examples directed to resins and none directed to a matrix glass (Saito, col. 5, lines 10-15). Therefore, since the properties of resins differ from those of glass and Saito

describes only the mixing of resins, Saito does not enable one of ordinary skill in the art to form applicants' claimed self-luminescent glass.

Moreover, even assuming Saito enables the formation of glass (which it does not), Saito cannot be combined with Odlum to form applicants' claimed self-luminescent glass. Saito describes only the mixing of resins with pigments having particle sizes ranging from 10-2000 microns and Odlum describes only producing glass artifacts with phosphorus particle sizes ranging from 18-25 microns. Applicants' claimed particle size range (i.e., from 0.8-20 mm or 0.8-2 mm) falls within the subset described in Saito with respect to resins, but not within the subset described in Odlum with respect to the glass. Applicants respectfully submit that it would be difficult for one of ordinary skill in the art to combine Saito with Odlum to arrive at applicants' claimed invention.

More specifically, one of ordinary skill would not look to combine the two references because the physical and chemical properties of resins are very different from those of glasses. Thus, it would not have been obvious to apply the methods discussed in Saito for producing resins (regardless of particle size) with the glass discussed in Odlum since the properties of the end product would be unpredictable. In particular, as discussed in Odlum, a slight variation in the amount of luminescent material causes "the molecular structure of the glass [to be] weakened to the point of mechanical decomposition" (Odlum, col. 2, lines 56-61). Therefore, an undue amount of experimentation would be required to combine Saito with Odlum to successfully form the self-luminescent glass defined by applicants' claims 1 and 17. Moreover, because

of the high degree of unpredictability and the undue amount of experimentation required, there is no reasonable expectation of success.

For at least these reasons and those stated above (with respect to claim 1) Masahiro does not make up for the deficiencies of Saito and Odlum relative to the rejection. Hase, Kanerari, Murazaki, and Yocom, cited by the Examiner as showing additional limitations of the claims, also do not make up for the deficiencies of Saito, Odlum, and Masahiro relative to the rejection.

Accordingly, applicants' independent claims 1 and 17, and claims 6-8, 12, 13, 16 and 18-19 which depend, directly or indirectly, from claim 1 or 17, are patentable.

Conclusion

For the reasons set forth above, applicants respectfully submit that this application, as amended, is in condition for allowance. Reconsideration and prompt allowance of this application are respectfully requested.

Respectfully submitted,

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